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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/427,815	10/27/1999	DAVID P. ROSSUM	17002-01400U	3803

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EXAMINER

GRAHAM, ANDREW R

ART UNIT PAPER NUMBER

2697

DATE MAILED: 02/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/427,815

Applicant(s)

ROSSUM, DAVID P.

Examiner

Andrew R Graham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

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DETAILED ACTION

Drawings

1. The drawings in this application are objected to by the Draftsperson as informal. The reasons for said objection are listed on the enclosed copy of the Notice of Draftsperson's Patent Drawing Review, PTO form 948. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The spacing of the lines of the specification is such as to make reading and entry of amendments difficult. New application papers with lines double spaced on good quality paper are required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. **Claims 1-33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Orban (USPN 6337999) in view of applicant's admitted known prior art.

Regarding **Claim 1**, Orban discloses a digital clipper that uses upsampling, downsampling, and summation to decrease aliasing and improves the accuracy of such an operation as compared to other methods of clipping. Specifically, Orban teaches a method of first upsampling an input digital signal, clipping the result of this interpolation, and then downsampling the modified signal before adding it to a delayed version of the original input signal (col. 3, lines 5-56). The upsampling and downsampling portions of this process read on "converting a signal to differing sample rates". The digital data that this process is performed on reads on "receiving, at a first sample rate, a plurality of data points". After the upsampling, the device shown in Figure 2 also includes a low pass filter (400) for removing the extra images caused by the upsampling circuit (200) (col. 3, lines 12-14). To remove unwanted images, the filter (400) must inherently be operating on the output signal of the upsampler with the knowledge of the parameters of the input signal in order to "know" what part of the output signal needs to be removed (col. 3, lines 11-13). The standard parts of a digital signal include a passband, which includes the frequencies with the image information, as well as a guardband or transition band. As the system initially receives the entire input signal and the filter is arranged to know the parameters of the passband of the image, this inherently means that the system

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has knowledge of the details of the initial transition band of the input signal as well. This inherent knowledge, along with the function of the filter (400) read on "operating on said plurality of data points to associate said signal with a predetermined set of parameters" and "said set of parameters including a first transition band". The operations and the output of the upsampler (400) read on "varying the sample rate associated with said first signal by interpolation with an interpolator" and "a second signal is produced having a sequence of data samples approximating the first signal".

In regards though to the specifics of the circuitry of his system, Orban does not specify:

- the interpolator that varies the sample rate has a second transition band associated with it
- the width of this second transition band is a function of the spectral separation of the transition band and image of the input signal

In the specification of the application, the applicant discloses several examples of previous forms of sample rate converters that are well known in the art. Specifically, the applicant discloses the various components of previously well known sample rate converters, including a variety of circuits referred to as "interpolation filters" (page 4, lines 14-16, 20, 31 and Figs. 1B, 2B, 2E, 3C, 3F). The two different versions of these mentioned in the specification as "classical" single stage interpolators are a "less conservative" one,

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which has a transition band equal to twice the guardband of the input signal and a "more conservative" one, which has a transition band equal to the guardband of the input signal (page 3, lines 21-25). These two types of interpolator filters read on "an interpolator having associated a second transition band, with the width associated with said second transition band being a function of a spectral separation of said first transition band and said image".

To one of ordinary skill in the art at the time of the invention, it would have been obvious to include an interpolation filter in the system of Orban as disclosed as prior well known art in the specification of the application. As discussed previously, Orban discloses separate components for interpolating and filtering the input signal; the motivation behind substituting a combined interpolation filter for the separate interpolator and filter would have been that it would have made each handling of the input values more efficient. Instead of interpolating a series of values and then later filtering the same values, the interpolator filter would have performed both operations on the series of values while only handling the values once.

Regarding **Claim 2**, Orban discloses that the filters (400-403) of Figure 2 are half-band, polyphase, symmetrical finite impulse response (FIR) filters (col. 3, lines 66-67 and col. 4, lines 1-3). In dealing with digital signals, the standard operating procedure of an FIR involves convoluting a finite set of coefficients with a finite and

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equal number of values from the input signal. The inherency of this operation reads on "producing each data sample associated with said second signal by convolving a predetermined finite number N of data points with an equal number of coefficients".

Regarding **Claim 3**, the standard operation of a digital FIR filter, such as that disclosed by Orban, inherently involves convolving the input data with the coefficients of the filter (col. 3, lines 66-67, and col. 4, lines 1-3). The very definition of a finite impulse response includes the feature that the coefficients of the realizing filter vary according to the input time currently being processed. This reads on "coefficients vary as a function of the temporal spacing between the output point and the corresponding input points".

Regarding **Claim 4**, the upsamplers (200-203) in the second embodiment of the invention increase the sample rate of the input signal (Figure 2 and col. 3, lines 60-67 and col. 4, lines 1-7). This reads on "varying said sample rate increases said sample rate".

Regarding **Claim 5**, the downsamplers (250-253) in the second embodiment of the invention decrease the sample rate of the input signal (Figure 2 and col. 4, lines 18-24). This reads on "varying said sample rate decreases said sample rate".

Regarding **Claim 6**, the upsamplers (200-203) of the second embodiment specifically double the sample rate of the input signal, which reads on "operating on said plurality of data points includes

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up-sampling said plurality of data points by a factor of two" (Figure 2 and col. 3, lines 60-67 and col. 4, lines 1-7).

Regarding **Claim 7**, filters (230-233) are specifically polyphase halfband FIR filters, which reads on "operating on said plurality of data points includes filtering said plurality of data points with a half-band filter" (col. 4, lines 22-24).

Regarding **Claim 8**, interpolator-filter combinations were discussed previously in regards to Claim 1. Decimation being the inverse of interpolation, decimation filters would be of the same processing nature as interpolation filters. Orban discloses filter-decimator pairs (230/250,231/251,232/252,233/253) that half-band filter an input signal and then decrease the sampling rate by a factor of two (col. 4, lines 18-24). Combined, following the same arguments and teachings of well known prior art as discussed previously, these half-band filter/downsampler pairs and their signal processing features read on "operating on said plurality of data points includes decimating said plurality of data points with a half-band decimator".

Regarding **Claim 9**, Figure 2 of Orban shows one embodiment of his system that decimates the signal received from upsamplers (200,201,202,203) with half-band filter/decimator pairs (230/250,231/251,232/252,233/253) (col. 4, lines 18-24). As discussed in regards to Claims 6 and 8, this reads on "decimating a plurality of data points output by said interpolator with a half band decimator, with varying said sample rate occurring after receiving said plurality of data points and before decimating said plurality of data points".

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Regarding **Claim 10**, the filters (400-403) that follow the upsamplers (200-203) are all half-band, polyphase symmetrical finite impulse response filters, which reads on "operating on said plurality of data points to associate said signal includes filtering the same with a finite impulse response filter" (col. 3, lines 66-67 and col. 4, lines 1-3).

Regarding **Claim 11**, the final processing stages of the embodiment shown in Figure 2 include a filter (420) that is a fifth order infinite impulse response (IIR) filter (col. 4, lines 37-45). This reads on "operating on said plurality of data points to associate said signal includes filtering the same with an infinite impulse response filter".

Regarding **Claim 12**, please refer to the like teachings of Claims 1, 6, and 7.

Regarding **Claim 13**, the embodiment of the system of Orban shown in Figure 2 includes several sequential pairs of upsamplers and filters (col. 3, lines 64-67 and col.4, lines 1-7). Specifically, Upsampler (200) outputs the signal received by filter (400), which in turn provides the input to upsampler (201). Upsampling is a specific form of interpolation, and such a combination would have made obvious the possibility of including other forms of interpolation. The sequence of components, specifically as disclosed though reads on "said halfband filtering is done in conjunction with upsampling said plurality of data points; and said interpolation follows said upsampling and halfband filtering".

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Regarding **Claim 14**, Orban discloses a system that involves separate processing circuits for upsampling, filtering, and downsampling. In the upsampling sequence shown in the embodiment in Figure 2, the FIR filter (400) performs the operation of half-band filtering the input signal without performing any other function, and the output of this component (400) is then passed along to upsampler (201), which interpolates the input signal (col. 1, lines 60-67 and col. 4, lines 1-7). This specific part of the sequence reads on "said halfband filtering is done, without upsampling, on said plurality of datapoints; and said interpolating follows said halfband filtering".

Regarding **Claim 15**, the embodiment of the system of Orban shown in Figure 2 includes an interpolator (201), where the output of this interpolator input into a halfband filter (401). This part of the processing sequence reads on "said halfband filtering follows said interpolating".

Regarding **Claim 16**, the embodiment of the system of Orban shown in Figure 2 includes an upsampler (200) in series with a half-band FIR filter (400) and another upsampler (201). Included further down the signal path are another half-band filter (230) and a decimator (250). With, again, the understanding that an upsampler is a specific form of interpolator, this sequence of components reads on "said half-band filtering is done in conjunction with upsampling" and said interpolating follows said halfband filtering" and "halfband filtering and decimation following said interpolation".

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Regarding **Claim 17**, Orban specifically discloses that the second embodiment is intended to be carried out by any conventional audio clipper that is realized by digital signal processing (col. 5, lines 29-32). Digital signal processing is well known in the art to be conducted by various types of computers, using various components, ranging from microprocessors to specific digital signal processors. These components generally all require some form of program to operate, which inherently reads on "A computer program product". The details of such systems, especially ones that convert data to and from different sampling rates inherently require some form of temporary and/or permanent data storage, which reads on "a computer-readable storage medium for storing code". Regarding the remaining features of the claim, please refer to the like teachings of Claim 1.

Regarding **Claim 18**, please refer to the like teachings of Claim 6. Regarding **Claim 19**, please refer to the like teachings of Claim 7. Regarding **Claim 20**, please refer to the like teachings of Claim 8. Regarding **Claim 21**, please refer to the like teachings of Claim 8. Regarding **Claim 22**, please refer to the like teachings of Claims 10 and 11. Regarding **Claim 23**, please refer to the like teachings of Claims 1, 6, 7, and 17. Regarding **Claim 24**, please refer to the like teachings of Claim 13. Regarding **Claim 25**, please refer to the like teachings of Claim 14. Regarding **Claim 26**, please refer to the like teachings of Claim 15. Regarding **Claim 27**, please refer to the like teachings of Claim 16.

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Regarding **Claim 28**, the applicant discloses as part of the background of the specification that Nth order FIR sample rate converters are known in that art fall under the category of 'intermediate quality' converters (page 8, lines 4-10). The applicant also gives a formula for determining the complexity of the involved computation of such a converter (Page 8, lines 7-10). This inherently reads on "interpolator is an FIR Nth order sum of products interpolator with linear interpolation of coefficients".

Regarding **Claim 29**, please refer to the like teachings of Claim 28.

Regarding **Claim 30**, the details of the widths of the transition bands of classical type of interpolation filters were discussed in reference to Claim 1. One of these admitted, well known interpolation filters involved a transition band that was twice the width of the guardband of the input signal (page 4, lines 14-15). Looking at Figure 2B, it can be seen that this width spans from the highest edge of the lowest frequency image to the lowest edge of the passband of the next image. This reads on "interpolator has a transition band beginning adjacent the top of a passband and ending adjacent the bottom of a passband image".

Regarding **Claim 31**, please refer to the like teachings of Claim 30.

Regarding **Claim 32**, one of the specific filtering components that Orban teaches is a fifth-order IIR filter with a sixth-order allpass group detector (col. 4, lines 39-42). With this arrangement in place,

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it would have been inherent that different orders of allpass detectors would have been usable in the system. Different orders perform the same general processing function, except with different numbers and arrangement of components, and with slightly variant output responses. The specifics of each of the different orders of allpass components would have been well known in the art, thus making evident the advantages and disadvantages of different orders in use with different systems. This reads on "said halfband filter is an IIR filter composed of first order allpass blocks".

Regarding **Claim 33**, please refer to the like teachings of Claim 32.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

White (USPN 5808924) discloses an allpass, first-order decimating IIR filter. Wang (USPN 5929795) discloses a digital processor for decreasing distortion that includes the separate operations of upsampling, filtering, and downsampling.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is (703) 308-6729. The examiner can normally be reached on Monday-Friday (7:30-4:30), excluding alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kimberly Williams, can be reached at (703)

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305-4863. The fax number for the organization where this application or proceeding is assigned is 703-872-9314 for regular communications, and 703-872-9315 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Andrew Graham

Andrew Graham
Examiner
A.U. 2697

KA Williams

Kimberly A. Williams
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